



# Astronomy Activities in Ethiopia

Solomon Belay Tessema (PhD)  
Director, Entoto Observatory and  
Research Center

# Outlines

## ❖ Introduction

Part I Outreach and other activities

Part II Institutional Development

## ❖ Introduction

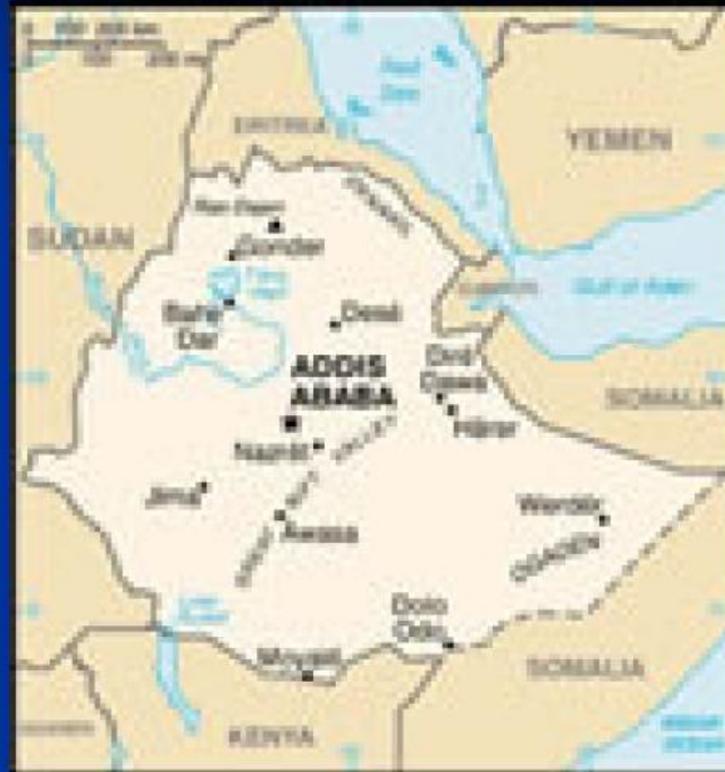
- Vision - Mission of EO
- Instruments of EO
- Staffs
- Current status
- Future plans

# EO Offices, Computer Rooms and Conference



COURTESY: ESS

# Ethiopia In Brief



- Varies from Latitude of 06°30'N to Longitude of 45°30'E
- Population: 84.9 million (UN, 2010)
- Capital: Addis Ababa
- Area: 1.13 million sq km (437,794 sq miles)
- **Currently Big Projects**
  - Renaissance Dam which can generate 6000 MWHR
  - Railway project
  - Housing Project
  - Road Project

# Introduction

- Astronomy and Space Science Program mainly linked with establishment of ESSS
- The main activities are
- Outreach and training
- Institutional Development
- Research

# Outreach and training

- 11 branches and 50 clubs are actively participating in astronomy and space science outreach program
- Each year primary and secondary teacher training program sponsored by ESSS
- General Assembly meeting in each year
- Astronomy I and II, Stellar Physics I & II are offered to Physics undergraduate program
- Space science courses

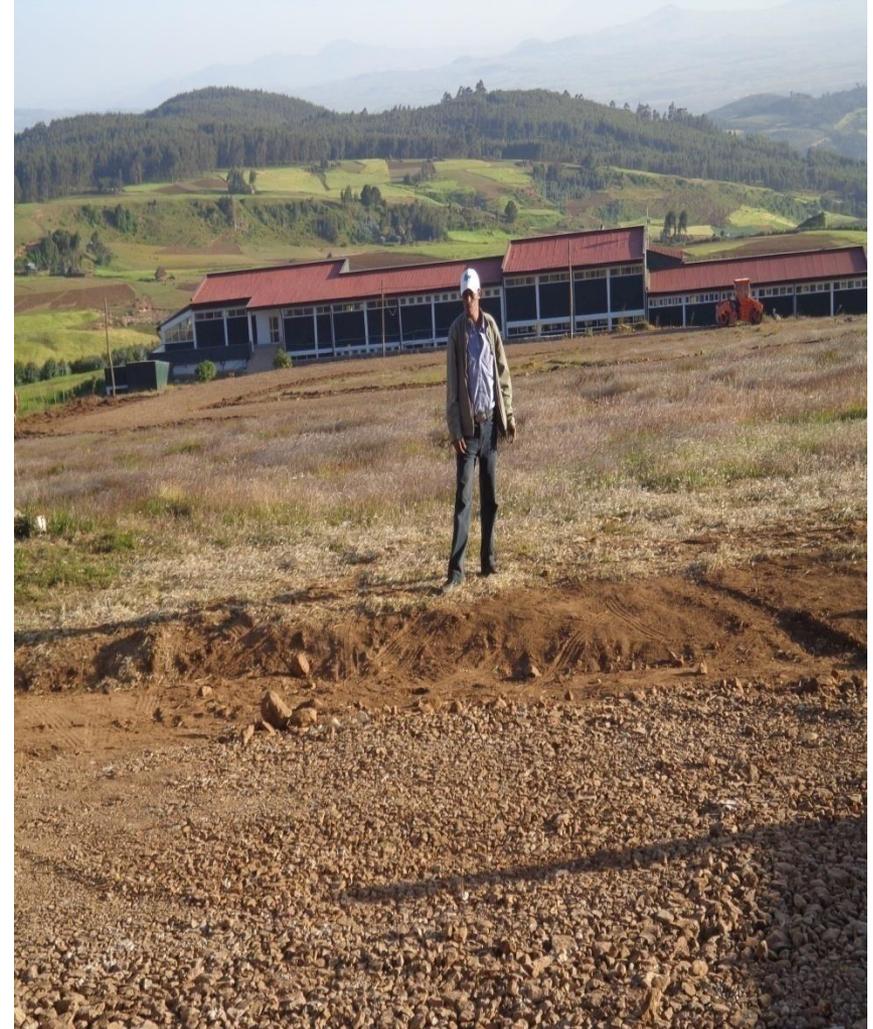
- All public universities were involved in financing astronomy programs
- Government is actively involving for Astronomy and space science program
- Training of MSc and PhD in astronomy and space science is our main targets
- Currently we have 50 Master's
- 10 PhD professionals in the country in astronomy and space science
- MSc. Program at Jimma university Theoretical Astrophysics,
- MSc. and PhD at AAU Astrophysics and Space Science
- MSc. and PhD at Bahir Dar University in Space Science

# Institutional Development

## ❖ Introduction

- Entoto Observatory was initially built by ESSS
- 85% fund came from ESSS
- In 2012/2013 EO has established as independent research center owned by 32 Public universities, ESSS and one private university
- Currently EO is financed by member Universities, ESSS and the government

# From the scratch to observatory



- The main objectives of EO is research and training
- It is national facility responsible to lead astronomy, space science, related science and technology, research and education at national level

# Vision-Mission of EO

## Vision

- To make Ethiopia effective and extensive user of astronomy, space science and technology, especially satellite science and technology applications in all aspects of the development of the country and become contributor to the development of astronomy, space science and related sciences by 2025.

# Mission

- Satisfy all astronomy, space science and technology, especially satellite science and technology needs of the country fully by 2025 meet all needs to all fields.
  - Develop the necessary Capacity and research to be contributor to the development of science and Technology of the field.
  - Build regional, continental and international network to be fast learning country in space science, astronomy and related technologies.
  - Promote space science, astronomy and related technologies, by establishing different outreach programs.

## Strategic goals

- Develop the human resource of the field, especially of the first priority area sufficiently.
- Build the necessary institutions of training research of the field.
- Develop strong link between public and private sector of the field in all aspects to work together to achieve the vision and the mission that enables accelerated development of the field.
- Develop efficient and effective regional, continental, and international collaboration for timely exchange of experience, knowledge, and skills to fill the gap to each other.
- Create awareness of the community; inspire the youth in space science, astronomy, and technology, as well as establish

# Instruments 1m telescope with upgrading dome

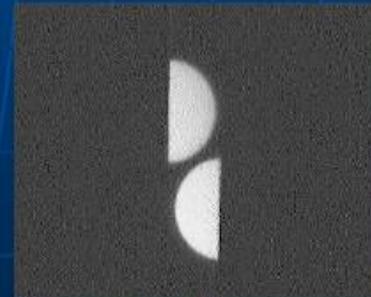
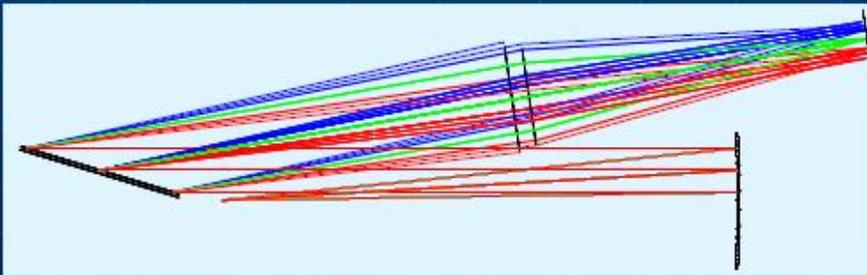
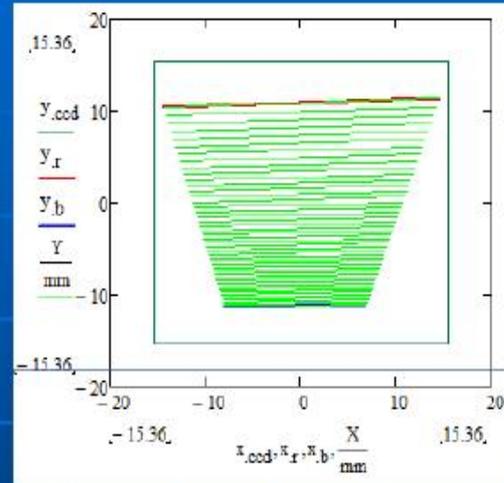
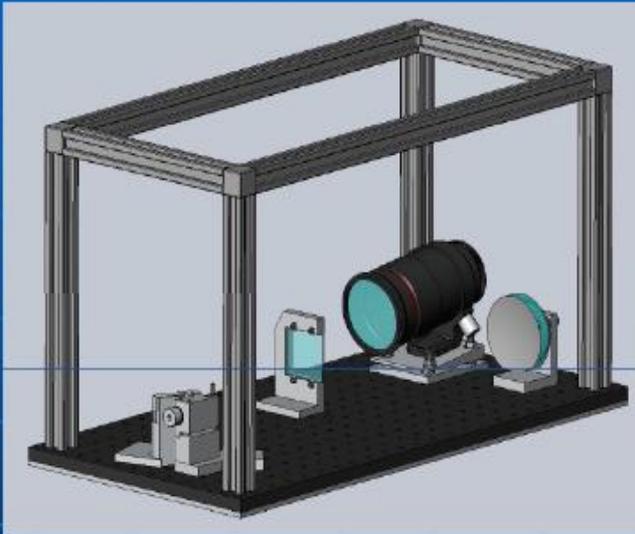


Optical parameters of the **ASTELCO Cassegrain-Nasmyth** configuration:

Primary mirror M1, free aperture	1.000mm
Primary mirror M1, mechanical diameter	~ 1.020mm
Primary mirror M1, focal ratio	2.6-2.8, TBD*
Distance M1 – M2	TBD*
Thickness (edge)	~50mm
Central hole	~ Ø 200mm
Secondary mirror M2, free aperture	280mm, TBD*
Thickness (edge)	~45mm
Backfocus distance from Nasmyth flange	300mm, TBD*
System-focal ratio	F/8
System accuracy (after M3)	$\lambda/6$ P-V at $\lambda = 632\text{nm}$
M1-M3 roughness, scattered light	Scratch and dig 40-20, $R_q < 5\text{nm}$ micro roughness
Corrected Field of View at Nasmyth focus With a 3 lens corrector	45 arc min (unvignetted, circular)
Mirror material	Low Expansion Glass
Size of M2 baffle	No direct skylight for 45 arc min FOV
Coating M1 – M3 (400 -1000nm)	Al + protection coating $R_{\text{max}} > 94\%$

## Telescopes for Mt Entoto

Instruments: FELCHES (fibre fed echelle spectrograph designed by Gerardo Avila, ESO. R = 41,000; 389nm – 765 nm)



- High Speed CCD camera
- Other latest accessories

# Expected Science

Time Series CCD Photometry of stars:

- Synoptic monitoring
- Variability of stars
- Periodic phenomena
- High Time Resolution
- Exoplanets
- X-ray binaries
- Gamma –Ray burst,

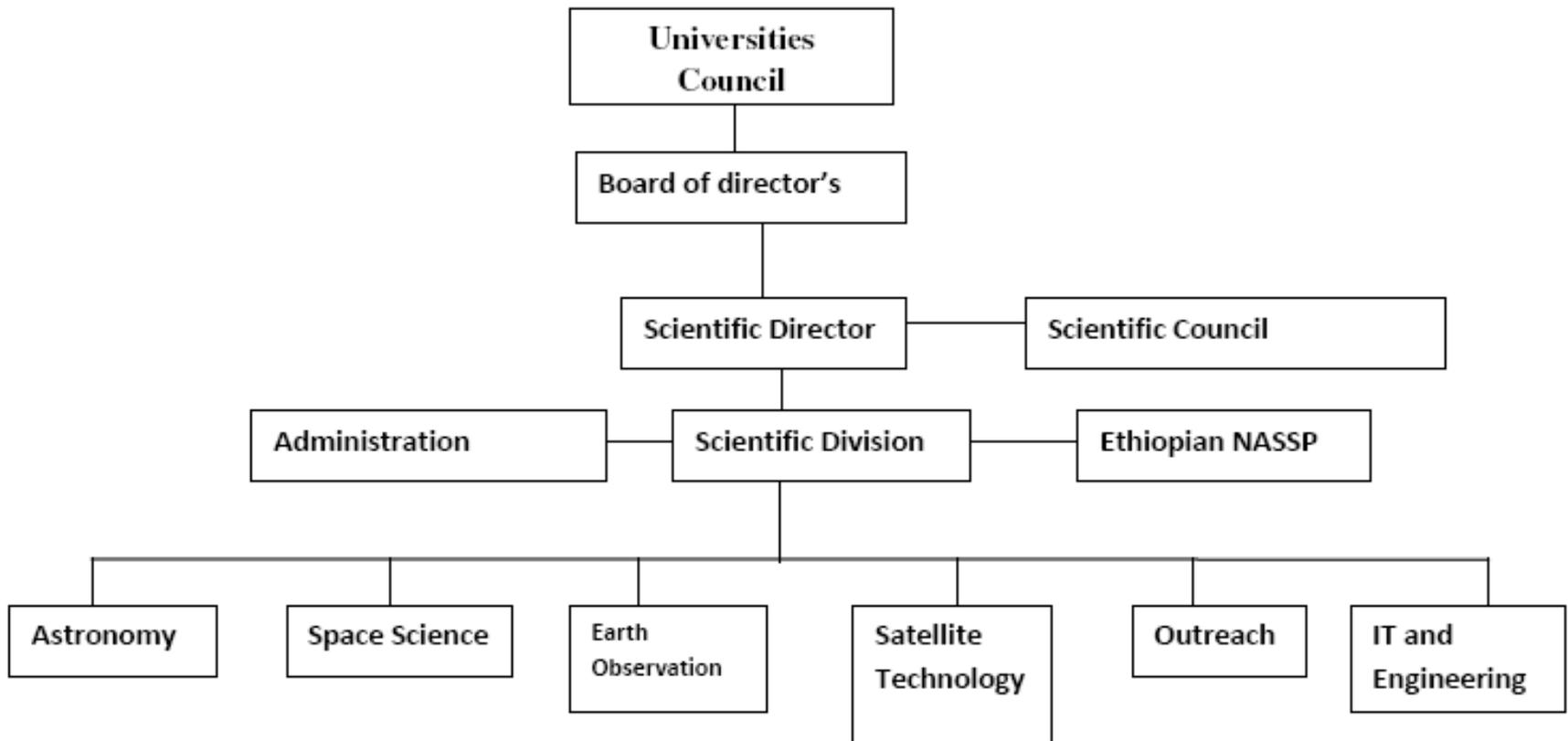
- Gravitational microlensing, etc

## Images

- Planetary Nebula
  - Galaxy
- 
- Observatory will serve for the region
  - Other instruments for Space science and Earth Observation are available

# Staffs

## Entoto Observatory (EO) Organizational Structure



# Currently Available staffs

- Astronomy and Astrophysics 3
- Earth Observation 2
- Space Science 1
- Satellite science 1
- IT and Engineering 4
- Administrative Staffs 12

25 Adjunct and visiting professors applied to assist EO PhD and MSc. Training

# Facilities

- Conference room
- PC rooms
- Data room (server room)
- Laboratories
- Guest houses
- Internet facility
- FPI
- Ionosode,
- DGPS

# Training Areas to be started soon

- MSc and PhD in Astronomy and Astrophysics
- Earth Observation (Geodesy, Remote Sensing)
- Satellite science (MSc)
- Space Science (MSc. and PhD)
- One year Post Graduate Program

# Collaboration

- With East African Colleagues



March 2014 OAD Cape Town

# Korean War Participating Countries Cooperation Framework for Astronomy and Space Science



March 2014 OAD Cape Town

# 2013년 한국전 참전 5개국 상생협의회 출범식

Korean War Participating Countries Cooperation Framework for Astronomy and Space Science

• 일자 : 2013. 6. 18(화) • 장소 : 장영실홀 • 주최 : KASI 한국천문연구원

You will always be  
our welcome guest!



- With Arizona University, USA
- Clemson University (CU) – USA signed MOU
- Calina Observatory Switzerland
- Denmark National Space science
- South Korea Science and Technology through MOST
- KASI
- Moscow State University

# Researches underway

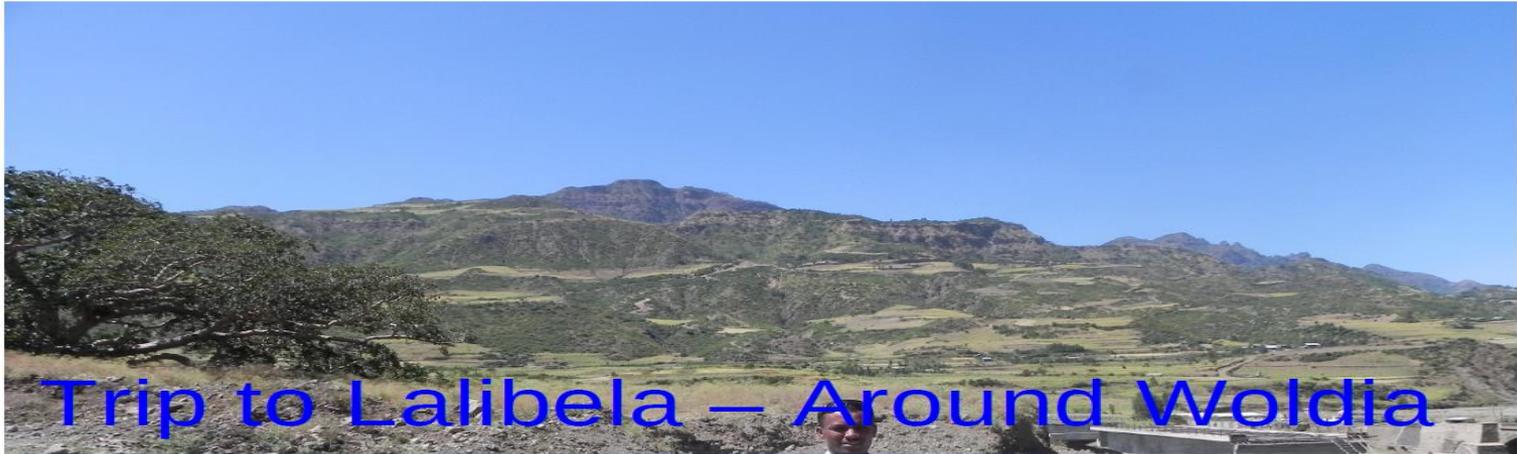
- Accretion Discs
- Astrophysical Plasma
- Characterization of Regional Ionosphere
- Radar technology budget
- Water
- Geodesy
- Remote sensing

# Future Plan

- Training and Research national and regional students and scientists
- Recruitment of additional staffs
- Post graduate diploma training starting from 2015
- Research and publication
- National space policy
- Staff Capacity Building
- Equipotent purchasing

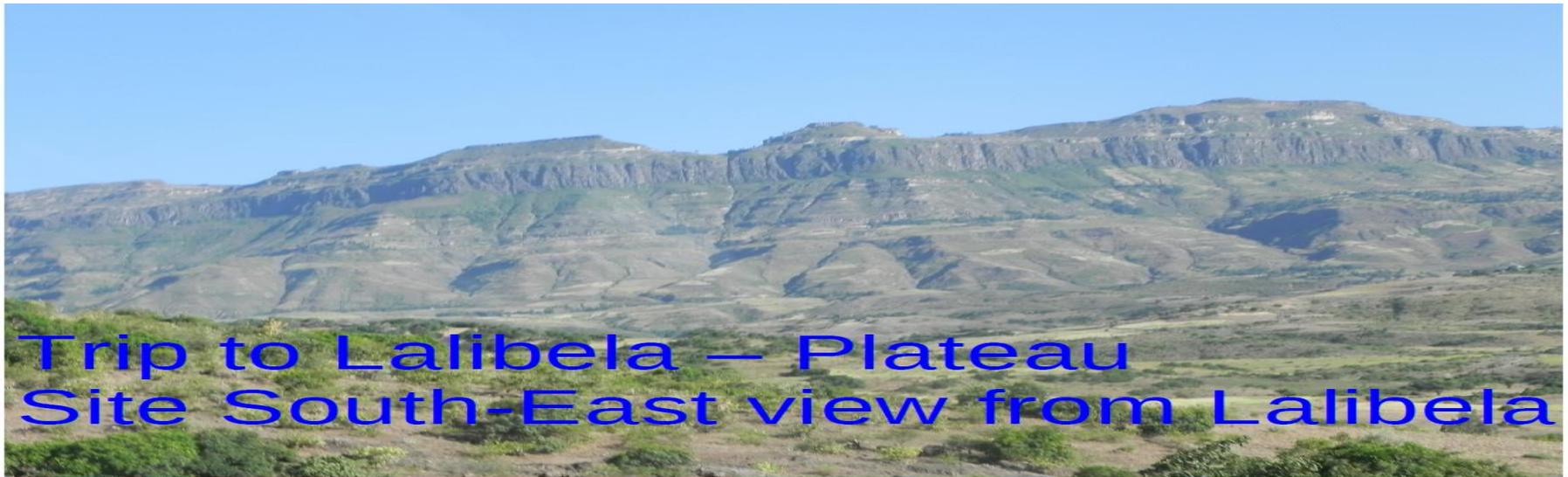
# Under way projects

- FPI installation
- Purchasing of equipments of Earth Observation
- Master's and PhD program facilities affiliated with Universities
- Office and other facilities project at Addis Ababa
- Lalibela site test project



Trip to Lalibela – Around Woldia

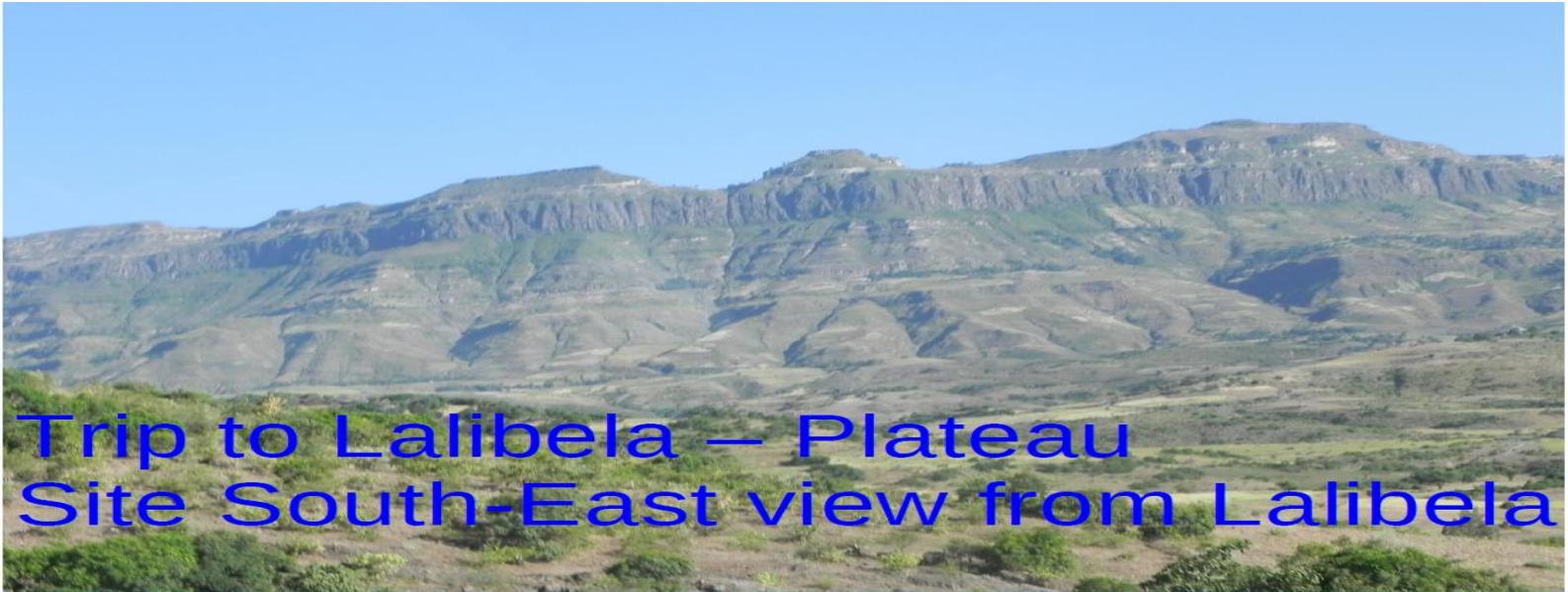




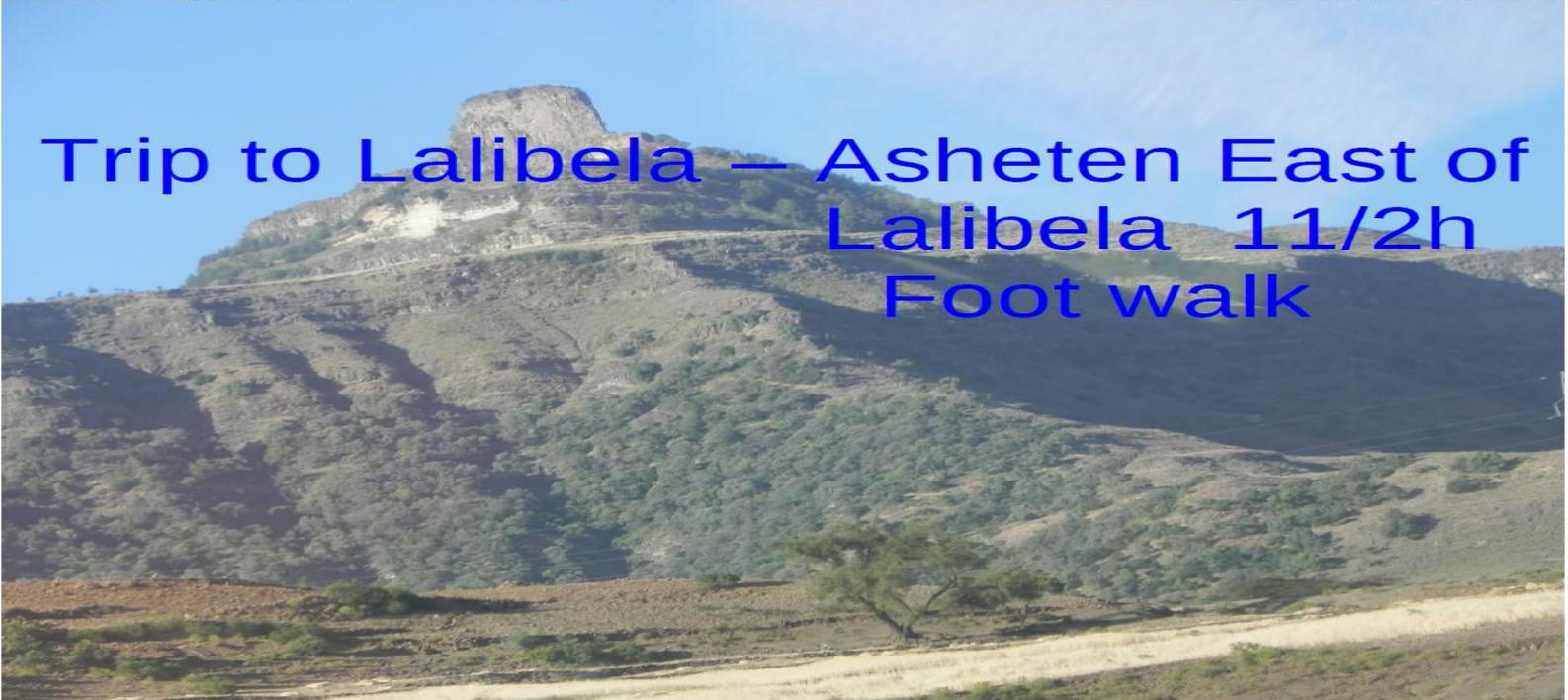
**Trip to Lalibela – Plateau  
Site South-East view from Lalibela**



**Trip to Lalibela – Asheten East of  
Lalibela 11/2h  
Foot walk**



Trip to Lalibela – Plateau  
Site South-East view from Lalibela



Trip to Lalibela – Asheten East of  
Lalibela 11/2h  
Foot walk

Potential site checking team around Lalibela – Discussion with Local Adminsrators & locating places on map





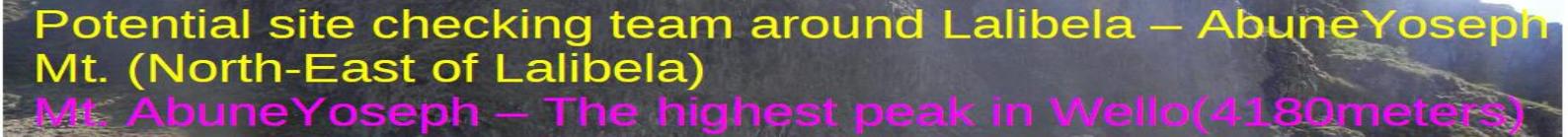
Potential site checking team around Lalibela – Heading towards AbuneYoseph Mt. (North-East of Lalibela)





Potential site checking team around Lalibela – Heading towards AbuneYoseph Mt. (North-East of Lalibela)  
Village Injafat at the base of Mt. AbuneYoseph





Potential site checking team around Lalibela – AbuneYoseph Mt. (North-East of Lalibela)  
Mt. AbuneYoseph – The highest peak in Wello(4180meters)





Potential site checking team around Lalibela – Abune Yoseph Mt. (North-East of Lalibela)

Mt. Abune Yoseph – The highest peak in Wollo(4180)



Potential site checking team around Lalibela – Abune Yoseph Mt. (North-East of Lalibela)

Mt. Abune Yoseph – The highest peak in Wollo(4180)



Potential to check in from around the globe. Also

# Another trip to Lalibela





# ROAD

- Ethiopia government allocated budget for ROAD
- Coordinator position advertised
- Offices secured
- Purchasing of office equipments started by MOST
- Supporting staffs budget secured



Thank you!!